

ME 2233 - Thermodynamic Principles

Credits and Contact Hours: 3 Credits. Three 50-minute or two 75-minute lectures per week.

Instructors: Ugur Pasaogullari, Bryan Weber, Thanh Nguyen

Textbook: *Fundamentals of Engineering Thermodynamics*, 8th edition, by M.J. Moran, H.N. Shapiro, D.D. Boettner, and M.B. Bailey, John Wiley & Sons, 2014.

Specific Course Information:

a. Catalog Description: Introduction to the First and Second Laws of Thermodynamics. Thermodynamic properties of pure substances and ideal gases. Analysis of ideal and real processes, including turbines, pumps, heat exchangers, and compressors.

b. Prerequisites: CHEM 1127Q or both CHEM 1124 and 1125; PHYS 1401Q or PHYS 1501Q

Corequisites: MATH 2110Q

c. Required, Elective, or Selected Elective: Required

Specific Goals:

a. Course Outcomes:

After completing ME 2233 students should be able to:

1. Understand & implement the principles of mass and energy conservation on various systems
2. Determine and identify a thermodynamic property, state, process, and system
3. Understand thermodynamic equilibrium and the state principle
4. Compute system & surroundings interactions
5. Understand equations of state and their limitations
6. Understand cycle efficiency and limits

b. Relationship of Course Outcomes to Criterion 3 Student Outcomes:

1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.
Students acquire the ability to utilize the laws of thermodynamics along with mathematical tools to analyze and solve complex engineering problems. Students learn to identify, formulate and solve basic engineering problems through assignments that involve the analysis of real thermal systems. Students are expected to identify the thermodynamic principles involved and to implement them to engineering interest.
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.
Students begin to acquire the ability to design thermal systems, components, and processes to meet a desired need.

3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
Not applicable.
4. An ability to communicate effectively with a range of audiences.
Not applicable.
5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
Students begin to analyze the environmental impact of thermal system design choices on the environment and economy.
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.
The class provides students with the recognition that subsequent courses and material will build upon the fundamental principles presented.
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.
Not applicable.

Topics Covered:

- ◆ Introductory concepts and definitions
- ◆ Energy and the first law of thermodynamics
- ◆ Properties of simple compressible substances
- ◆ Closed system energy analysis
- ◆ Open system energy analysis
- ◆ Second law of thermodynamics
- ◆ Entropy